CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

ORDER No. 00-124
UPDATED SITE CLEANUP REQUIRMENTS AND RECISSION OF ORDER 88-013 FOR:

LOCKHEED MARTIN SPACE SYSTEMS COMPANY, MISSILES & SPACE OPERATIONS
MATHILDA/JAVA, LLC
SUNNYVALE MATHILDA LAND, LLC

for the properties located at:

1111 LOCKHEED MARTIN WAY, 1302, AND 1350 NORTH MATHILDA AVENUE
SUNNYVALE
SANTA CLARA COUNTY

The California Regional Water Quality Control Board, San Francisco Bay Region (hereinafter called the Regional Board) finds that:

SITE DESCRIPTION AND BACKGROUND

1. Lockheed Martin Corporation (also known as Lockheed Martin; Lockheed Martin Corporation, Missiles & Space; Lockheed Martin Missiles and Space; and Lockheed Martin Space Systems Company) is hereinafter referred to as Lockheed.

2. Lockheed owns and operates the aerospace research and fabrication facility located at 1111 Lockheed Martin Way, near the intersection of Mathilda Avenue and Highway 237 in the northern portion of the City of Sunnyvale, Santa Clara County. This facility is known as the Plant One Site (the site). Its location is illustrated in Figure 1.

3. Prior to 1956, the site location was farmland. Emplacement of the first Lockheed facilities began in 1956 with the construction of Building 103. Manufacturing operations began in 1958. By 1963, most of the Lockheed manufacturing and chemical processing facilities were in place.

4. The site covers about 660 acres and historically included about 35 large buildings and structures used as research, testing, manufacturing, laboratory, and office facilities. The facility also included about 30 smaller, fixed buildings and mobile structures used for storage, maintenance, office, and covered workspace. Over the past few years, several buildings and structures have been demolished or decommissioned as portions of the site have been divested. Figure 2 illustrates the site boundaries and layout.

5. The site lies about one mile southeast of the San Francisco Bay. The site stretches 8000 feet north to south and 4300 feet east to west at its widest. Site elevation ranges from 35 feet above mean sea level (MSL) in the south to 3 feet below MSL in the north. Guadalupe Slough and Moffett Channel are located just beyond flood protection dikes north of the site boundary.

6. Adjoining the site on the west and southwest is Moffett Field Naval Air Station that preceded Lockheed in the area by at least 25 years. Directly to the north are the brine ponds of the Leslie Salt Company that were constructed in the 1950's. To the east lie office buildings that displaced farmland between 1974 and 1980. To the south and southeast across Highway 237 are residential neighborhoods, trailer parks, and small office and commercial buildings.

PURPOSE AND SCOPE OF ORDER

7. The **purpose** of this Order is to update site cleanup requirements (SCRs) that were adopted in Regional Board Order No. 88-013 on January 20, 1988. The intent of this Order is to (1) establish cleanup standards for groundwater contamination that exists at the site due to historic facilities operations, and (2) establish requirements for evaluating the effectiveness of the final remedy at cleaning up groundwater contamination.

RESPONSIBLE PARTIES

8. SCR Order No. 88-013 identified Lockheed as the sole discharger at the site. However, since 1988, Lockheed has divested several properties that are located within the boundaries of the current or historic soil or groundwater impacts at the site. Although Lockheed has indemnified the purchasers of the divested properties, the Regional Board considers all property owners within the site to be responsible parties in addition to Lockheed. Table 1 summarizes the divested properties and owners at the site. Figure 2 illustrates the locations of the divested properties.

9. Lockheed is named as a discharger because of substantial evidence that it discharged pollutants to soil and groundwater at the site. The Regional Board considers Lockheed to be the primary responsible party for cleanup of contamination at the entire site, including the divested properties. The Regional Board expects that Lockheed will continue to implement Regional Board requirements at the entire site until impacts and threats to water quality and human and environmental health are completely abated.

10. The parties identified in Table 1 are named as responsible parties because they currently own properties at the site that have been impacted by pollutants to soil or groundwater. The Regional Board considers the purchasers of Lockheed's divested properties to be secondary responsible parties for cleanup of contamination at their properties only (unless their actions lead to additional impacts or contaminant migration). The Regional Board does not pursue secondary responsible parties where the primary responsible party has the financial resources necessary to conduct the remediation, and where the primary responsible party is satisfactorily engaged in conducting the required remediation.

Table 1 Identified Responsible Parties at the Plant One Site

Responsible Party	Property Location	Property Description
Lockheed	1111 Lockheed Martin Way.	Plant One Site
Mathilda Java, LLC	1302/1350 North Mathilda Avenue.	7.87 acres identified with assessor's parcel number 110-26-044; includes Buildings 177 and 178.
Sunnyvale Mathilda Land, LLC	Westside of North Mathilda Avenue straddling 1st Avenue.	34.05 acres identified with assessor's parcel numbers 110-01-023 and 110-01-030; includes Buildings 160, 161, 162, & 170.
Sunnyvale Mathilda Land, LLC	North of former Building 170.	Includes location of former Building 130.

REGULATORY HISTORY

Site Cleanup Requirements

11. In January 1987, Lockheed presented the Regional Board with information that identified chlorinated and fluorinated VOCs, hexavalent chromium (Cr^{6+}), and elevated nitrates (NO_3) impacts to shallow groundwater beneath the site. These impacts were discovered during investigation and monitoring activities associated with petroleum underground storage tanks (USTs). In response, the Regional Board requested further delineation of groundwater impacts throughout the site.

12. In September 1987, the first phase of a site-wide groundwater investigation and hydrogeologic characterization was initiated to determine the lateral and vertical extent of groundwater contamination. The Phase I results identified impacts to two distinct groundwater zones. In response, the Regional Board adopted SCR Order No. 88-013 on January 20, 1988.

13. SCR 88-013 required Lockheed to perform the following activities and provide the following submittals. All requirements of SCR 88-013 have been complied with.

    a. Define all on-site sources
    b. Define the lateral and vertical extent of soil and groundwater contamination
    c. Assess the appropriateness of existing wells for monitoring groundwater plumes and piezometric surfaces in each groundwater zone
    d. Perform a comprehensive site-wide hydrogeologic characterization addressing the following:
        - Aquifer and aquitard delineation,
        - Degree of aquifer interconnectedness and communication,
        - Aquitard integrity,
        - Vertical and horizontal gradients and inferred groundwater flow directions,
        - Contaminant flow paths, and

- Seasonal groundwater level fluctuations

e. Determine background water quality for each groundwater zone
f. Prepare a Monitoring and Reporting Program (MRP) and Sampling and Analysis Plan (SAP) for monitoring groundwater impacts in each groundwater zone
g. Evaluate and implement interim remedial measures for soil contamination removal and hydraulic control of groundwater impacts
h. Evaluate the effectiveness of the interim hydraulic containment system
i. Prepare a comprehensive remedial investigation (RI) and feasibility study (FS) for selection of final remedies

Waste Discharge Requirements (WDRs)

14. In 1982, Lockheed began operation of the Process Water Treatment & Reclamation Facility (PWTRF) to manage the wastewater generated during the fabrication and finishing of metal parts. This operation consisted of a treatment unit, two, double-lined holding ponds (3 acres total), and two, double-lined evaporation ponds (2 to 3 acres total).

15. The holding and evaporation ponds were built above ground and were considered Class II surface impoundments subject to regulation under Title 23, Chapter 15 of the California Code of Regulations, subsequently relocated to Title 27, California Code of Regulations. The Regional Board adopted WDR Order No. 81-067 to establish the construction, operating, and monitoring criteria for the Class II surface impoundments.

16. The evaporation ponds were used to store and condense concentrated acids, alkali, neutral salt baths, and other cleaning, pickling, plating, etching, and anodizing agents prior to off-site disposal. In 1987 the PWTRF and evaporation ponds were certified "clean-closed" by the California Department of Health Services, Toxics Division (now the Department of Toxic Substances Control (DTSC)).

17. The holding ponds continue to be operated as equalization and stabilization ponds for rinse water effluent from the Plant One facility. Rinse water effluent includes diluted wastes from rinse tanks, quench waters, floor drainage, and contaminated area drainage from eight chemical process facilities. Rinse waters contain low-levels of oils, organics, heavy metals, and cleaning compounds such as nitrates, phosphates, chlorides, and sulfates. Wastewater from the holding ponds is discharged to the Sunnyvale publicly-owned treatment works (POTW) under a pretreatment program.

18. In 1989, the Regional Board adopted WDR Order No. 89-106 that established additional monitoring requirements for the holding ponds and rescinded WDR 81-067. The holding ponds are currently monitored semi-annually with seven perimeter monitoring wells (MW175-1 through 7) and six bottom lysimeters. No releases have been detected since the initiation of the monitoring program

Resource Conservation and Recovery Act (RCRA) Analogous Oversight

19. Lockheed managed hazardous waste at the site pursuant to an Interim Status Document issued under the Resource Conservation and Recovery Act (RCRA). The Interim Status Document was rescinded by the California Department of Health Services on July 24, 1984. Due to the operation of the surface impoundments, the site is subject to the corrective action requirements of RCRA under 42 USC 6925(i).

20. A cooperative effort now exists among USEPA, DTSC and the Regional Board that attempts to consolidate the substantive requirements of each agency so that one lead agency can provide oversight activities at the site. When the Regional Board is the lead agency, such as in this case, the Regional Board requires the same substantive corrective action process, and the oversight provided by the Regional Board is referred to as the "RCRA Equivalent" or "RCRA Analogous" oversight. The "RCRA Analogous" oversight is designed to reduce the potential for overlapping agency requirements and work duplication. The RCRA corrective action process primarily includes four phases: (1) RCRA Facility Assessment (RFA), (2) RCRA Facility Investigation (RFI), (3) Corrective Measures Study (CMS), and (4) Corrective Measures Implementation (CMI). Lockheed Martin has completed the first three phases and has been implementing corrective measures under Regional Board direction since 1992.

HYDROGEOLOGIC CHARACTERIZATION AND PLUME DELINEATION

21. In response to SCR 88-013, Lockheed conducted two additional phases of site-wide groundwater investigation and hydrogeologic characterization. Phases II and III (1989 & 1990) were performed to more fully delineate the lateral and vertical extent of groundwater contamination and to better characterize site hydrogeology and the degree of interconnectedness between water-bearing zones.

Hydrogeologic Characterization

22. The Plant One Site is located in the central portion of the Santa Clara Valley. The water-bearing deposits of the Santa Clara Valley consist of semi-consolidated to unconsolidated valley fill derived from the adjacent Diablo and Santa Cruz highlands. These deposits include "older" alluvium atop the Santa Clara Formation and "younger" alluvium above that. In the Sunnyvale area, the younger alluvium typically extends to depths of about 1000 feet below ground surface (fbgs).

23. The younger alluvium beneath the Plant One Site is comprised of alternating layers of fine-grained and coarse-grained deposits. Regionally, the coarse-grained deposits of the sequence comprise an upper and a lower aquifer. In general, the upper aquifer extends to 100 fbgs and is separated from the lower aquifer by an extensive confining clay layer from 100 to 150 fbgs. The lower aquifer extends to the top of the older alluvium of the Santa Clara Formation (generally at depths around 1000 fbgs).

24. At the Plant One Site, four distinct water-bearing zones have been identified and characterized to a depth of 160 fbgs. These include three moderately to highly permeable zones and one low

permeability zone. The more permeable zones are referred to as transmissive zones and are identified with depth as the first, second, and third transmissive zones (T1, T2, and T3). The lower permeability zone is referred to as the intermediate zone or IZ and separates the second and third transmissive zones. The depth and thickness of each zone is summarized in Table 2.

Table 2. Depths of Occurrence of Groundwater Transmissive Zones at the Plant One Site

Transmissive Zone	Typical Depths (fbgs)
First Zone (T1)	5 to 25
Second Zone (T2)	30 to 55
Intermediate Zone (IZ)	70 to 90
Third Zone (T3)	130 to 160

25. The upper-most transmissive zone (T1) is characterized by a five to twenty-foot thick sequence of moderately to highly permeable materials interbedded with thin units of low permeability materials. Highly permeable materials are defined as clean sands and gravels, moderately permeable materials are defined as sands and gravels with some clays and silts present, and low permeability materials are defined as predominantly clays and silts. The second transmissive zone (T2) is generally characterized by a five to fifteen-foot thick sequence of moderately to highly permeable materials interbedded less frequently with thin low permeability units. Piezometric surfaces in both transmissive zones occur between five and ten fbgs. Based on evaluation of water level and aquifer pumping test data, good hydraulic connection exists locally between the first and second transmissive zones.

26. A network of buried stream channels trending north - south across the site has been generally delineated in the first and second transmissive zones. Buried channels are inferred from the presence of relatively thin layers of highly permeable materials within relatively larger sequences of moderately permeable materials, and from knowledge of the local depositional environment (braided stream).

27. The third transmissive zone (T3) is characterized by a series of five to fifteen-foot thick sequences of moderately permeable materials separated by five to fifteen-foot thick units of low permeability materials. The moderately permeable sequences are interbedded with thin lower permeability units.

28. The intermediate zone (IZ) consists mainly of low permeability materials interbedded with thin units of moderately permeable materials. Although these thin beds may provide conduits for lateral migration, as a whole, the large thickness of low permeability materials in the intermediate zone appears to provide good hydraulic separation between the second and third transmissive zones.

29. Groundwater gradients at the site are summarized in Tables 3 and 4. The horizontal groundwater gradients in the first and second transmissive zones are consistently to the north-northeast. Groundwater extraction from wells located in the northeastern corner of the site and

screened across the first and second transmissive zones, was implemented in 1992 as a plume containment strategy. Prior to pumping, horizontal gradients in the first and second zones were typically northeasterly at 0.002 to 0.004 ft./ft. Although groundwater extraction has had little effect on the direction of the horizontal gradients, it does cause their magnitude to increase slightly within a few hundred feet of the extraction wells.

30. Aquifer tests have been performed in the first and second transmissive zones. Wells 160-1 and 160-2 were used as pumping wells while wells OP-1, 2, & 3 were used as observation wells. Based on hydraulic conductivity estimates, measured hydraulic gradients, and estimated porosities, the average linear groundwater velocity in the first and second transmissive zones is estimated between 0.5 and 2.5 feet/day.

31. The horizontal gradient in the third transmissive zone has been measured both to the northeast (12/88, 1/90) and to the southwest (1/94, 1/97). In all cases, the magnitude of the gradient has been about 0.001 ft./ft.

32. In general, a slight downward vertical gradient exists between the first and second transmissive zones and a slight upward gradient exists between the second and third transmissive zones. Under non-pumping conditions, head differences between each transmissive zone are typically one foot or less. Under pumping conditions, upward vertical gradients between the second and third transmissive zones can increase substantially since groundwater withdrawl occurs from the first and second transmissive zones only. Furthermore, under long-term pumping conditions there may be substantial upwelling of groundwater from the intermediate and third transmissive zones into the second transmissive zone.

Table 3 **Summary of Horizontal Groundwater Gradients at the Plant One Site**

Transmissive Zone	Without Groundwater Extraction		With Groundwater Extraction	
	Direction	Magnitude (ft./ft.)	Direction	Magnitude (ft./ft.)
T1	Northeasterly	0.002 to 0.004	Northeasterly	0.002 to 0.006
T2	Northeasterly	0.003 to 0.004	Northeasterly	0.003 to 0.006
T3	Northeast or Southwest	0.001	Northeast or Southwest	0.001

Table 4 **Summary of Vertical Groundwater Gradients at the Plant One Site**

		Without Groundwater Extraction	With Groundwater Extraction
Transmissive Zones	Direction		Magnitude (ft./ft.)
T1 – T2	Downward	0.02 to 0.05	0.02 to 0.05
T2 – T3	Upward	0.008 to 0.01	0.008 - 0.1

Background Groundwater Quality

33. Various regional investigations indicate that localized portions of the upper and lower aquifers fringing the San Francisco Bay have been intruded by saltwater. Saltwater intrusion is believed to be due to a combination of land subsidence, tidal water seepage, and excessive groundwater pumping. At the site however, hydrogeologic characterization indicates that saltwater intrusion is not a significant problem in either the upper or lower transmissive zones. For the first and second zones, the maximum total dissolved solids (TDS) and chloride concentrations detected are 1300 mg/l and 150 mg/l, respectively. For the intermediate and third transmissive zones, TDS ranges from 200 to 310 mg/l.

Nearby Supply Wells

34. The closest municipal supply well is located up-gradient of the site about one-quarter (¼) mile to the south. This well may no longer be in use and may be closed. All other municipal supply wells are also located up-gradient of the site and are mostly screened in the lower regional aquifer at a depth greater than 150 fbgs.

35. A number of private wells exist within two miles of the site. All of these wells are located up-gradient of the site, to the south or west. Most private wells are also screened in the lower regional aquifer at a depth greater than 150 fbgs.

Groundwater Impacts and Plume Delineation

36. Based on investigation results, the following principal contaminants have been identified in groundwater beneath the site:

VOCs

- tetrachloroethene (PCE)
- trichloroethene (TCE)
- 1,1-dichloroethene (1,1-DCE)
- 1,1,1-trichloroethane (1,1,1-TCA)
- 1,1-dichloroethane (1,1-DCA)
- 1,1,2-trichloro-1,2,2-trifloroethane (Freon-113)
- tetrachlorofloromethane (TCFM, Freon-11)

Hexavalent Chromium (Cr^{6+})

Nitrate (NO_3)

37. Table 5 summarizes the maximum reported impacts to groundwater beneath the site. Contaminant concentrations for the historic and most recent time periods summarized in Table 5 are not necessarily for the same location. Figures 3 and 4 illustrate the lateral extent of select VOC, Cr^{6+}, and NO_3 groundwater plumes in the first and second transmissive zones at the time of the initial characterization (1987- 1989). VOCs that have been detected in the first and

second transmissive zone wells (PCE, DCE, and DCA) are almost always present in conjunction with TCE or TCA. Therefore, the extent of TCE and TCA presented in Figures 3 and 4 generally encompasses the other VOCs. A significant reduction in contaminant concentration in the first and second transmissive zone has occurred since the initial characterization. As the tables and figures indicate, groundwater in the third transmissive zone has not been significantly impacted.

Table 5 Summary of Maximum Reported Historical and Current Groundwater Impacts to Each Transmissive Zone at the Plant One Site

Contaminant	Maximum Concentration During Initial Characterization (1987–1991) (ug/l)			Maximum Concentration During Most Recent Characterization (1999–2000) (ug/l)		
	T1	T2	T3	T1	T2	T3
PCE	50	40	ND	19.1	8.6	---
TCE	820	3400	5	27	800	---
1,1-DCE	210	160	ND	ND	15.4	---
1,1,1-TCA	2000	58	10.7	1.9	1.1	---
1,1-DCA	20	4.9	ND	ND	ND	---
TCFM	110	140	ND	7.3	8	---
Freon-113	500	14,000	ND	96	4300	---
Cr^{6+}	810	1100	ND	66	165	---
NO_3	314,000	283,000		19,000	24,000	---

'---' No Data.

38. At the time of the initial plume characterization, VOC impacts in the first and second transmissive zones had migrated a few hundred feet off-site beyond the northeastern boundary of the site. The most significant of these impacts was the off-site migration of TCE (see Figure 3). After implementation of a groundwater extraction system, hydraulic control was established and further off-site migration was mitigated. Presently, only residual TCE concentrations remain off-site beyond the northeastern corner of the site. Table 6 summarizes off-site TCE impacts.

Table 6 Off-Site TCE Groundwater Impacts Beyond the Northeastern Site Boundary

Off-Site Well No.	Transmissive Zone	Maximum Historic Concentration (ug/l)	Most Recent Concentration (ug/l)
OS-1	T1	359 (4/91)	160 (1/94)
OS-3	T1	114 (7/91)	27 (1/00)
OS-6	T1	110 (11/89)	8 (1/94)
OS-9	T1	6 (4/91)	<0.5 (1/00)
OS-2	T2	29 (10/92)	2 (1/94)
OS-4	T2	16 (1/92)	6 (1/00)
OS-7	T2	4 (10/91)	0.9 (1/94)
OS-10	T2	<0.5 (1989)	<0.5 (1/00)

Source Area Investigations and Remediation

39. In accordance with SCR 88-013, investigations were performed site-wide to identify soil contamination and probable source areas for groundwater contamination. Source locations generally include operational areas related to manufacturing processes where spills or leaks occurred. The primary sources at these locations were typically aboveground or in-ground storage or containment vessels such as tanks, sumps, drums, clarifiers, etc., that leaked at various times over the 30 to 40 year history of the site.

40. Tables 7 through 9 summarize probable source locations for each contaminant in groundwater identified. In general, groundwater source locations were identified using the following lines of evidence:

- Identification of substantial spill or leak locations and/or soil sampling (Soil Investigation).
- Groundwater sampling and/or soil sampling near the groundwater table in locations where substantial soil contamination was encountered (Soil/GW Investigation).
- Groundwater plume delineation and mapping to identify most probable source locations (Plume Delineation).

Table 7 Summary of Probable Source Locations for VOCs in Groundwater at the Plant One Site

Probable Source Location, Area, Facility, Process, and/or Vessel	Lines of Evidence	Contaminant(s)
Bldg. 151 - east side chemical storage yard ("backyard" area) and/or unknown source at southwest corner of Bldg 151	Soil/GW Investigations; Plume Delineation (PCE & TCE in wells 142-1, 151-1, 151-3 & 151-5; TCA in wells 151-1 & 151-3)	PCE, TCE, TCA
East side of Bldg. 170 - chemical storage area, tanks & sumps.	Plume Delineation (PCE in wells 170-6, 170-9, & OS-1; TCE in wells 170-6, 170-9, 170-12 & OS-1)	PCE, TCE
Bldg 182 – 12,000 gal. degreaser & other TCE usage/spill areas.	Plume Delineation (TCE in wells 160-1, 161-1, 186-2, 186-3, & 186-4; PCE in wells 186-3 and 186-4)	TCE, possibly PCE
East side of Bldg. 187 - former 3,000 gal. waste coolant oil holding tank.	Soil/GW Investigations; Plume Delineation (PCE in wells 187-1 & 182-3; TCA in wells 182-1 & 182-4)	PCE, TCA
West side of Bldg. 142 - sanitary sewer catch basin.	Soil Investigations; Plume Delineation (TCA in well 142-1)	TCA
Site 14E hazardous waste storage area including 2,000 gal. waste oil tank & sump.	Soil/GW Investigations; Plume Delineation (PCE & TCE in wells 041-9, 102-1 & 103-2)	PCE, TCE
Site 14E hazardous waste storage area or the west side of Bldg. 102 - TCA spill area.	Plume Delineation (TCA in well 103-2)	TCA
North of Bldg 156 – unknown source.	Plume Delineation (TCA in wells 156-1, 175-3B, 6, & 7)	TCA
PWTRF area – unknown source.	Plume Delineation (PCE in wells 175-3B, 6, & 7; Freon-113 & TCFM in well 175-10)	PCE, Freon-113, TCFM
Northeast corner of Site 14E hazardous waste storage area – unknown source.	Plume Delineation (Freon-113 & TCFM in well 102-1)	Freon-113, TCFM

Table 8 Summary of Probable Source Locations for Hexavalent Chromium (Cr^{6+}) and Nitrate (NO_3) in Groundwater at the Plant One Site

Probable Source Location, Area, Facility, Process, and/or Vessel	Lines of Evidence	Contaminant(s)
South side of Bldg. 182 - metal process wastewater sumps.	Soil Investigation; Plume Delineation (Cr^{6+} in wells 182-1 & 182-4)	Cr^{6+}
Northeast of Bldg 160 – unknown source or migration of plume center	Plume Delineation (Cr^{6+} in wells 160-1 & 161-1)	Cr^{6+}
Sodium-Nitrate Clarifier, Bldg 170	Plume Delineation (nitrate in well 170-1)	NO_3
Farm fertilizer applications prior to Plant One Facility existence.	Elevated nitrate levels throughout north-central portion of site with no nitrate usage in those areas	NO_3

Petroleum Hydrocarbons & Methyl-tertiary Butyl Ether (MtBE)

41. Historically, petroleum hydrocarbons have been identified in soil and groundwater at specific locations at the site. Generally, petroleum hydrocarbon impacts were associated with UST leaks or spills. Currently, petroleum hydrocarbon impacts have been remediated and no cleanup requirements are specified in this Order. Table 9 summarizes the maximum reported, current and historical petroleum hydrocarbon & MtBE impacts in groundwater at the site. Table 10 summarizes the probable source locations for the historic petroleum hydrocarbon and MtBE impacts to groundwater.

42. Some additional confirmation monitoring is necessary for MtBE at the former gasoline UST locations described in Table 10. Specific monitoring requirements for MtBE are described later in this Order.

Table 9 Summary of Maximum Reported Historical and Current Petroleum Hydrocarbon & MtBE Groundwater Impacts to Each Transmissive Zone at the Plant One Site

Contaminant	Maximum Concentration During Initial Characterization (1987–1991) (ug/l)			Maximum Concentration During Most Recent Characterization (1999–2000) (ug/l)		
	T1	T2	T3	T1	T2	T3
TPH-g	45,000	---	---	26	---	---
TPH-d	---	---	---	52	---	---
Benzene	14,000	---	---	ND	---	---
Toluene	15,000	---	---	ND	---	---
Ethyl Benzene	28,000	---	---	ND	---	---
Xylenes	150,000	---	---	ND	---	---
MtBE	5.3*	ND	---	ND	ND	---

'---' No Data.
* Data is from 1997.

Table 10 Summary of Probable Source Locations for Historic Petroleum Hydrocarbon and/or MtBE Impacts in Groundwater at the Plant One Site

Probable Source Location, Area, Facility, Process, and/or Vessel	Lines of Evidence	Contaminant(s)
Bldg. 109 Service Station – three 10,000 gal. gasoline USTs removed in 1989.	Soil/GW Investigation	TPH-g, BTEX
Bldg. 186 – one 750 gal gasoline UST removed in 1983.	Soil/GW Investigation	TPH-g, BTEX
MPARC – two 5,000 gal. & two 6,000 gal gasoline USTs removed in 1988; one 20,000 gal. gasoline UST removed in1997.	Soil/GW Investigation	TPH-g, BTEX, MtBE

GROUNDWATER REMEDIATION

43. Based on results of the site-wide groundwater investigation and hydrogeologic characterization, remedial alternatives were evaluated and presented in a Feasibility Study (FS) in 1990. Groundwater extraction was selected as the preferred remedial alternative.

44. A Remedial Action Plan (RAP) was submitted in 1990 that proposed groundwater extraction using a line of extraction wells along the northeast corner of the site to contain and capture dissolved-phase groundwater contamination. The RAP was implemented in two phases in 1992 and 1993. Phase 1 was initiated in February 1992 and phase 2 was initiated in March 1993.

45. The Phase 2 groundwater extraction system, implemented in March 1993 and currently operating, consists of eleven extraction wells located along the northeastern corner of the site (see Figure 2). Extraction wells are screened from ten to forty fbgs across the first and second transmissive zones. Extracted groundwater is discharged to the City of Sunnyvale's sanitary sewer under permit.

46. In 1995, an effectiveness evaluation was performed on the groundwater extraction system. The report concluded that the extraction system was effectively capturing and containing the groundwater plumes and total contaminant mass removal was good. Currently, the groundwater extraction system continues to effectively capture and contain the groundwater plumes. Since system inception, about 745 pounds of VOCs have been removed.

GROUNDWATER MONITORING

47. In accordance with SCR 88-013, a Sampling and Analysis Plan (SAP) was prepared and initiated in August 1988. The SAP was revised in 1989, 1991, 1993, and 1997 to incorporate additional wells to better monitor the three transmissive zones. In 1994 and 1997, several wells were removed from the SAP and destroyed. Currently, Lockheed maintains a network of 95 monitoring wells and 11 extraction wells. Groundwater levels are measured and mapped quarterly to demonstrate on-site plume containment. Groundwater sampling and analysis is performed quarterly for extraction wells and annually for selected monitoring wells.

BASIN PLAN AND RESOLUTIONS

48. The Regional Board adopted a revised Water Quality Plan for the San Francisco Bay Basin (Basin Plan) on June 21, 1995. This updated and consolidated plan represents the Regional Board's master water quality control planning document. The State Water Resource Control Board (SWRCB) and the Office of the Administrative Law (OAL) approved the revised Basin Plan on July 20 and November 13, respectively, of 1995. A summary of regulatory provisions is contained in Section 3912, Title 23 of the California Code of Regulations. The Basin Plan defines beneficial uses and water quality objectives for waters of the State, including surface water and groundwater.

49. SWRCB Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California", requires attainment of background water quality, or the highest quality reasonable if background quality cannot be attained. Cleanup levels other than background must be consistent with the maximum benefit to the people of the State, must not unreasonably affect present and anticipated beneficial uses of the water, and must not exceed applicable water quality objectives.

50. The Basin Plan provides that all groundwaters are considered suitable, or potentially suitable, for municipal or domestic water supply (MUN) and that, in making any exceptions, the Regional Board will consider the criteria referenced in Regional Board Resolution No. 89-39, "Sources of Drinking Water", where:

(a) The total dissolved solids exceed 3,000 mg/l (5,000 µS/cm, electrical conductivity), and it is not reasonably expected by the Regional Board that the groundwater could supply a public water system, or

(b) There is contamination, either by natural processes or human activity (unrelated to the specific pollution incident), that cannot reasonably be treated for domestic use using best management practices or best economically achievable treatment practices, or

(c) The water source does not provide sufficient water to supply a single well capable of producing an average, sustained yield of 200 gallons per day.

51. SWRCB Resolution No. 92-49, "Policies and Procedures for Investigations and Cleanup and Abatement of Discharges Under Water Code Section 13304", establishes policies and procedures to be used by the Regional Board when (1) determining when a person is required to investigate, cleanup, or abate a discharge, (2) concurring with the discharger's selection of cost-effective investigation and remedial measures, (3) overseeing implementation of investigation and remedial measures, and (4) determining schedules for investigation and remedial measures.

BENEFICIAL USES OF GROUNDWATER AND SURFACE WATER

Groundwater

52. The site resides within the boundaries of the Santa Clara Valley Groundwater Basin, as defined in the Basin Plan. The existing and potential beneficial uses identified for groundwater in this basin, according to the Basin Plan, include:

- Municipal and Domestic Supply (MUN)
- Industrial Process Supply (PROC)
- Industrial Service Supply (IND)
- Agricultural Supply (AGR)

53. Based on the hydrogeologic characterization and water quality data for the site, groundwater underlying the site qualifies as a potential source of drinking water in accordance with Regional Board Resolution 89-39. Therefore, all of the above beneficial uses apply to groundwater beneath the site.

Surface Water

54. The existing and potential beneficial uses for surface water in Guadalupe Slough and the wetlands along the Southern San Francisco Bay, according to the Basin Plan, include:

- Ocean, Commercial, and Sport Fishing (COMM)
- Preservation of Rare and Endangered Species (RARE)
- Water Contact Recreation (REC1)
- Non-Water Contact Recreation (REC2)

- Fish Migration (MIGR)
- Fish Spawning (SPWN)
- Wildlife Habitat (WILD)
- Estuarine Habitat (EST)

BASIS FOR CLEANUP STANDARDS

55. In accordance with SWRCB Resolution 68-16, groundwater contamination should be cleaned up to background levels (typically non-detect for organics). However, the Regional Board recognizes that it may be technologically and/or economically infeasible to cleanup contaminants to background levels at the site. Therefore, cleanup standards are developed for the protection of applicable existing and potential beneficial uses, where impacts or threats of impacts exist.

56. Based on hydrogeologic characterization and plume delineation, no impacts or threats to surface water exist at the site. Therefore, cleanup standards are based on protection of existing and potential beneficial uses of groundwater as identified in Finding No. 52.

CALIFORNIA ENVIRONMENTAL QUALITY ACT

57. This action is categorically exempt from provisions of the California Environmental Quality Act pursuant to Section 15301, Title 14 of the California Code of Regulations.

NOTICIFICATION AND PUBLIC PARTICIPATION

58. The following elements of public participation have occurred regarding the update of site cleanup requirements and selection of a final remedy for the site:

    - The Regional Board notified the discharger(s) and interested agencies and persons of its intent to update site cleanup requirements (SCRs) for the site.
    - Tentative SCRs were mailed to the discharger(s) and interested parties and posted on the Regional Board's Internet site.
    - An announcement was advertised in a newspaper and distributed locally via flyer regarding the scheduling of a local public meeting to relay information and hear comments regarding the tentative SCRs.
    - A minimum 30-day period was established for submitting written comments.
    - A public meeting was held locally to relay information and hear and consider comments regarding the tentative SCRs.
    - A public meeting was held at the Regional Board to hear and consider comments.

IT IS HEREBY ORDERED pursuant to the authority in Section 13304 of the California Water Code (CWC) that the discharger(s), their agents, successors, and assigns, shall comply with the following:

A. PROHIBITIONS

1. The discharge of wastes or hazardous substances in a manner that will degrade water quality or adversely effect beneficial uses of waters of the State is prohibited.

2. Further significant migration of wastes or hazardous substances through subsurface transport to waters of the State is prohibited.

3. Activities associated with the investigation and cleanup of subsurface pollution that may cause significant adverse migration of wastes or hazardous substances are prohibited.

B. CLEANUP STANDARDS

1. The cleanup standards summarized in Table 11 shall be met in groundwater beneath all portions of the site.

Table 11 Groundwater Cleanup Standards for the Plant One Site

Constituent	Cleanup Standard (ug/l)	Basis for Cleanup Standard
PCE	5	CA DHS primary MCL
TCE	5	CA DHS primary MCL
1,1-DCE	6	CA DHS primary MCL
cis-1,2-DCE	6	CA DHS primary MCL
trans-1,2-DCE	10	CA DHS primary MCL
1,1,1-TCA	200	CA DHS primary MCL
Freon-113	1200	CA DHS primary MCL
TCFM (Freon-11)	150	CA DHS primary MCL
Cr^{6+}	50	CA DHS primary MCL for Total Chromium
NO_3	45,000	CA DHS primary MCL
MtBE	5	Taste & Odor threshold

2. Compliance with cleanup standards in Table 11 shall be demonstrated using the Self-Monitoring Program (SMP) attached to this Order or as amended by the Executive Officer.

C. TASKS

1. **Implementation of RAP**: The discharger(s) shall continue to implement groundwater extraction as proposed in the 1990 RAP and as revised in the 1995 extraction well effectiveness evaluation.

RAP COMPLIANCE DATE: IMMEDIATE

2. **Remediation Effectiveness Evaluation**: The discharger(s) shall perform an evaluation of the effectiveness of the existing groundwater extraction system. The purpose of the evaluation is to (1) estimate the rate of contaminant mass reduction in groundwater, and (2) estimate the time required to achieve cleanup standards for contaminants in groundwater at all locations on-site and off-site. The contaminant plumes to be evaluated include halogenated VOCs (including Freon-113 and TCFM) and hexavalent chromium.

   The need for additional remedial measures will be determined, in part, based on the estimated time to achieve cleanup standards. Currently, groundwater extraction wells are located several hundred feet down-gradient from contaminant source area locations. Although the system is effectively capturing and containing dissolved-phase contaminants, the amount and rate of contaminant mass reduction may not be sufficient to achieve cleanup standards in a reasonable time frame. Therefore, depending on results of the effectiveness evaluation, additional remedial measures, including source-area remediation (e.g., groundwater extraction, enhanced in-situ bioremediation, etc.) may be necessary.

   The effectiveness evaluation shall be documented in a technical report, acceptable to the Executive Officer that includes the following components and information:

   a. Extent of groundwater contamination

      A comparative presentation of the initial versus current extent of contaminant plumes shall be made. The initial extent of each plume was presented in the 1999 Source Investigation and Characterization report and was made using data from 1987 to 1989. These plume maps may also be used in this evaluation. Alternately, another data set may be used from a similar early time period.

      The current extent of plumes shall be determined using new data collected in accordance with the updated Self-Monitoring Program (SMP) attached to this Order (see Task No. 3). The semi-annual monitoring data collected for the next year according to the SMP, shall be averaged for each well then mapped to determine the current extent of each contaminant plume in each transmissive zone.

b. Mass Reduction and Plume Stability

Isoconcentration maps and an analysis of the volume and contaminant mass, in each plume in each transmissive zone, shall be presented for initial and current conditions. Using an appropriate method, estimate the volume of impacted groundwater and the total contaminant mass for each plume. Summarize the estimation methods, calculations, and parameters used. In one or more tables, summarize the estimated volume and mass for each sub-area within a plume (e.g., between isoconcentration lines), and for the total plume. Graphically compare the changes in plume volume and mass over time (current vs. initial conditions) and discuss the implications on plume stability.

c. Time to Reach Cleanup Standards

Using the changes in plume mass and volume, estimate the rate of mass reduction for each plume and the time required for contaminant concentrations to reach the cleanup standards presented in Table 11. Summarize the estimation methods, calculations, and parameters used. In one or more tables, summarize the estimated mass reduction rates and times to achieve cleanup standards for each plume.

d. Source-Area Evaluation

For monitoring wells located in plume source areas, and for monitoring wells with the highest initial and current contaminant concentrations for each plume, graphically illustrate time series concentration trends (sample date vs. sample concentration). Use as complete a data set as possible for each well. Discuss the results with respect to the potential existence of soil sources and non-aqueous phase liquid (NAPL).

e. Nitrate Evaluation

On one map, plot initial and current nitrate concentrations at monitoring wells. Discuss the probable sources of elevated nitrates in groundwater at the site and summarize changes over time. Highlight areas where concentrations exceed regulatory criteria.

EFFECTIVENESS EVALUATION REPORT DUE DATE: SEPTEMBER 17, 2001

3. **Five-Year Effectiveness Evaluations**: The discharger(s) shall perform a remediation effectiveness evaluation, as described in Task No. 2, every five years until the groundwater cleanup standards presented in Table 11 are achieved. Each five-year evaluation shall be tailored to the specific remediation type and/or system implemented at the site at that time, if it differs from what is in effect now. A workplan shall be submitted at least six months prior to the five-year evaluation report due date, if changes to the methods described in Task No. 2 are proposed. The workplan shall describe the proposed evaluation methods.

FIRST FIVE-YEAR EFFECTIVENESS EVALUATION REPORT DUE DATE: SEPTEMBER 17, 2006

4. **Self-Monitoring Program**: The discharger(s) shall comply with the updated Self-Monitoring Program (SMP) as attached to this Order and as may be amended by the Executive Officer. The attached SMP is designed to collect information necessary to perform the remediation effectiveness evaluation specified in Task No. 2. Upon completion of the remediation effectiveness evaluation described in Task No. 2, the discharger(s) may submit a proposed revised SMP for Regional Board consideration.

SMP COMPLIANCE DATE: IMMEDIATE

D. PROVISIONS

1. **No Nuisance**: The storage, handling, treatment, or disposal of polluted soil or groundwater shall not create a nuisance as defined in California Water Code Section 13050(m).

2. **Good O&M**: The discharger(s) shall maintain in good working order and operate as efficiently as possible any facility or control system installed to achieve compliance with the requirements of this Order.

3. **Cost Recovery**: The discharger(s) shall be liable, pursuant to California Water Code Section 13304, to the Board for all reasonable costs actually incurred by the Board to investigate unauthorized discharges of waste and to oversee cleanup of such waste, abatement of the effects thereof, or other remedial action, required by this Order. If the site addressed by this Order is enrolled in a State Board-managed reimbursement program, reimbursement shall be made pursuant to this Order and according to the procedures established in that program. Any disputes raised by the discharger(s) over reimbursement amounts or methods used in that program shall be consistent with the dispute resolution procedures for that program.

4. **Access to Site and Records**: In accordance with California Water Code Section 13267(c), the discharger(s) shall permit the Board or its authorized representative:

   a. Entry upon premises in which any pollution source exists, or may potentially exist, or in which any required records are kept, which are relevant to this Order.

b. Access to copy any records required to be kept under the requirements of this Order.
c. Inspection of any monitoring or remediation facilities installed in response to this Order.
d. Sampling of any groundwater or soil which is accessible, or may become accessible, as part of any investigation or remedial action program undertaken by the discharger(s).

5. **Self-Monitoring Program**: The discharger(s) shall comply with the Self-Monitoring Program as attached to this Order and as may be amended by the Executive Officer.

6. **Contractor / Consultant Qualifications**: All technical documents shall be signed by and stamped with the seal of a California registered geologist, a California certified engineering geologist, or a California registered civil engineer.

7. **Lab Qualifications**: All samples shall be analyzed by State-certified laboratories or laboratories accepted by the Regional Board using approved EPA methods for the type of analysis to be performed. All laboratories shall maintain quality assurance/quality control (QA/QC) records for Board review. This provision does not apply to analyses that can only reasonably be performed on-site (e.g. temperature).

8. Document Distribution: Copies of all correspondence, technical reports, and other documents pertaining to compliance with this Order shall be provided to the Santa Clara Valley Water District. In addition, the USEPA, Santa Clara County, Department of Environmental Health, the City of Sunnyvale, and the California Department of Toxic Substances Control shall receive a copy of each Effectiveness Evaluation Report".

9. **Reporting of Changed Owner or Operator**: The discharger(s) shall file a technical report summarizing any changes in site occupancy or ownership. If portions of the site are divested, a figure must be included that clearly illustrates the divested property location and boundaries relative to the entire site.

10. **Reporting of Hazardous Substance Release**: If any hazardous substance is discharged in or on any waters of the State, or discharged or deposited where it is, or probably will be, discharged in or on any waters of the State, the discharger(s) shall report such discharge to the Regional Board by calling (510) 622-2300 during regular office hours (Monday through Friday, 8:00 to 5:00). A written report shall be filed with the Board within five working days. The report shall describe: the nature of the hazardous substance, estimated quantity involved, duration of incident, cause of release, estimated size of affected area, nature of effect, corrective actions taken or planned, schedule of corrective actions planned, and persons/agencies notified. This reporting is in addition to reporting to the Office of Emergency Services required pursuant to the Health and Safety Code.

11. **Secondary-Responsible Parties**: Within sixty days after being notified by the Executive Officer that the primary responsible party has failed to comply with this order, the secondary responsible parties identified in this Order shall then be responsible for complying with this Order. Task deadlines above will be automatically adjusted to add sixty days.

12. **Rescission of Existing Order**: This Order supercedes and rescinds Regional Board Order No. 88-013.

13. **Periodic SCR Review**: The Board will review this Order periodically and may revise it when necessary.

I, Loretta K. Barsamian, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on November 29, 2000.

Loretta K. Barsamian
Executive Officer

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FAILURE TO COMPLY WITH THE REQUIREMENTS OF THIS ORDER MAY SUBJECT YOU TO ENFORCEMENT ACTION, INCLUDING BUT NOT LIMITED TO: IMPOSITION OF ADMINISTRATIVE CIVIL LIABILITY UNDER WATER CODE SECTIONS 13268 OR 13350, OR REFERRAL TO THE ATTORNEY GENERAL FOR INJUNCTIVE RELIEF OR CIVIL OR CRIMINAL LIABILITY.

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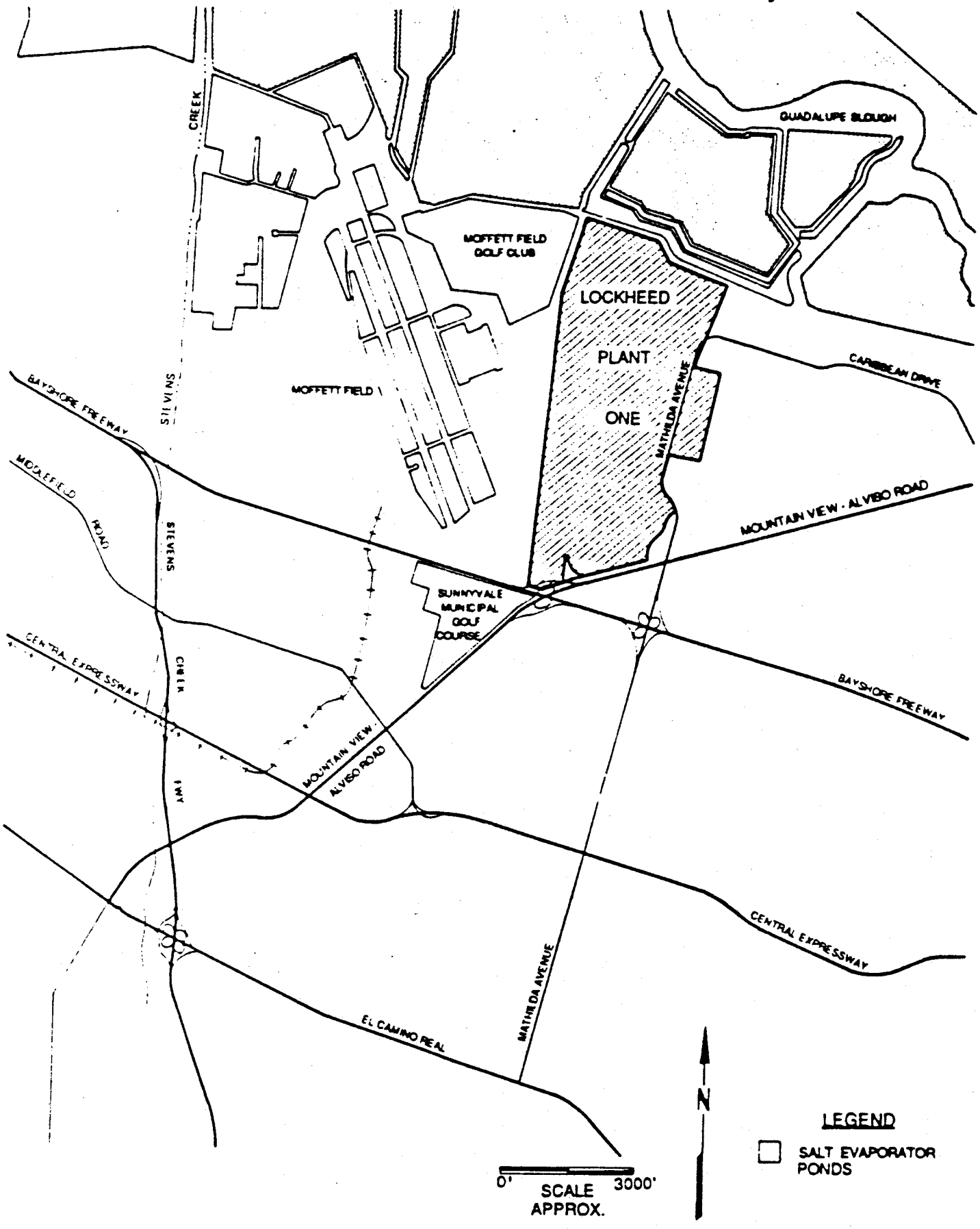
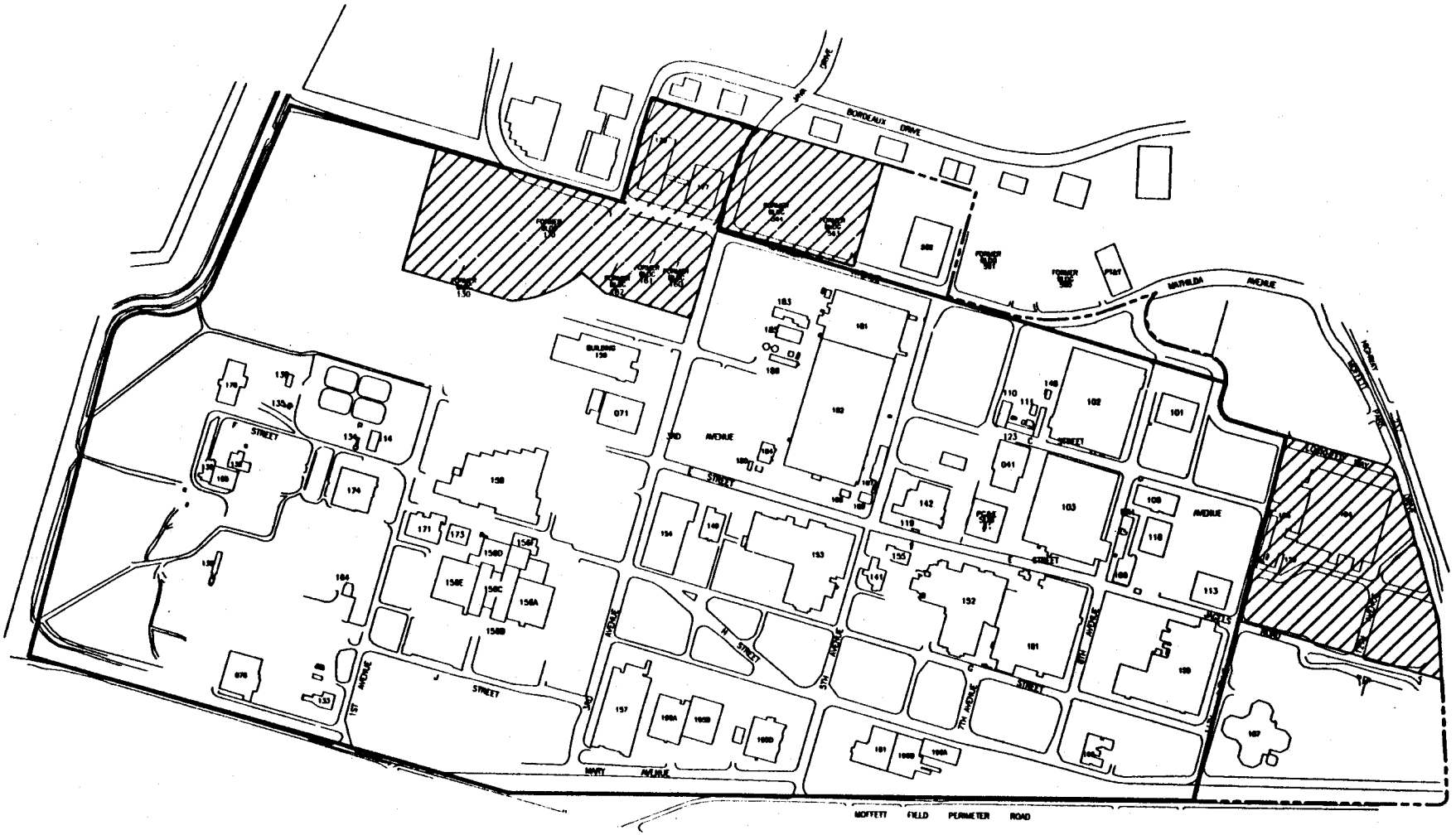
Attachments:

Figures
Self-Monitoring Program

Figure 1
Site Location Map
Lockheed Plant One Facility





LEGEND

- FORMER SITE BOUNDARY
- CURRENT SITE BOUNDARY
- DIVESTED PROPERTIES

0 1000

FEET

792701-29

LOCKHEED PLANT ONE FACILITY	
FIGURE 2 SITE BOUNDARIES AND DIVESTED PROPERTIES	
SCALE: 1" = 1000'	DATE: 11/22/00

Figure 3
Initial Distribution of Contaminants
in the First Transmissive Zone
Lockheed Plant One Facility
(1987 - 1990)

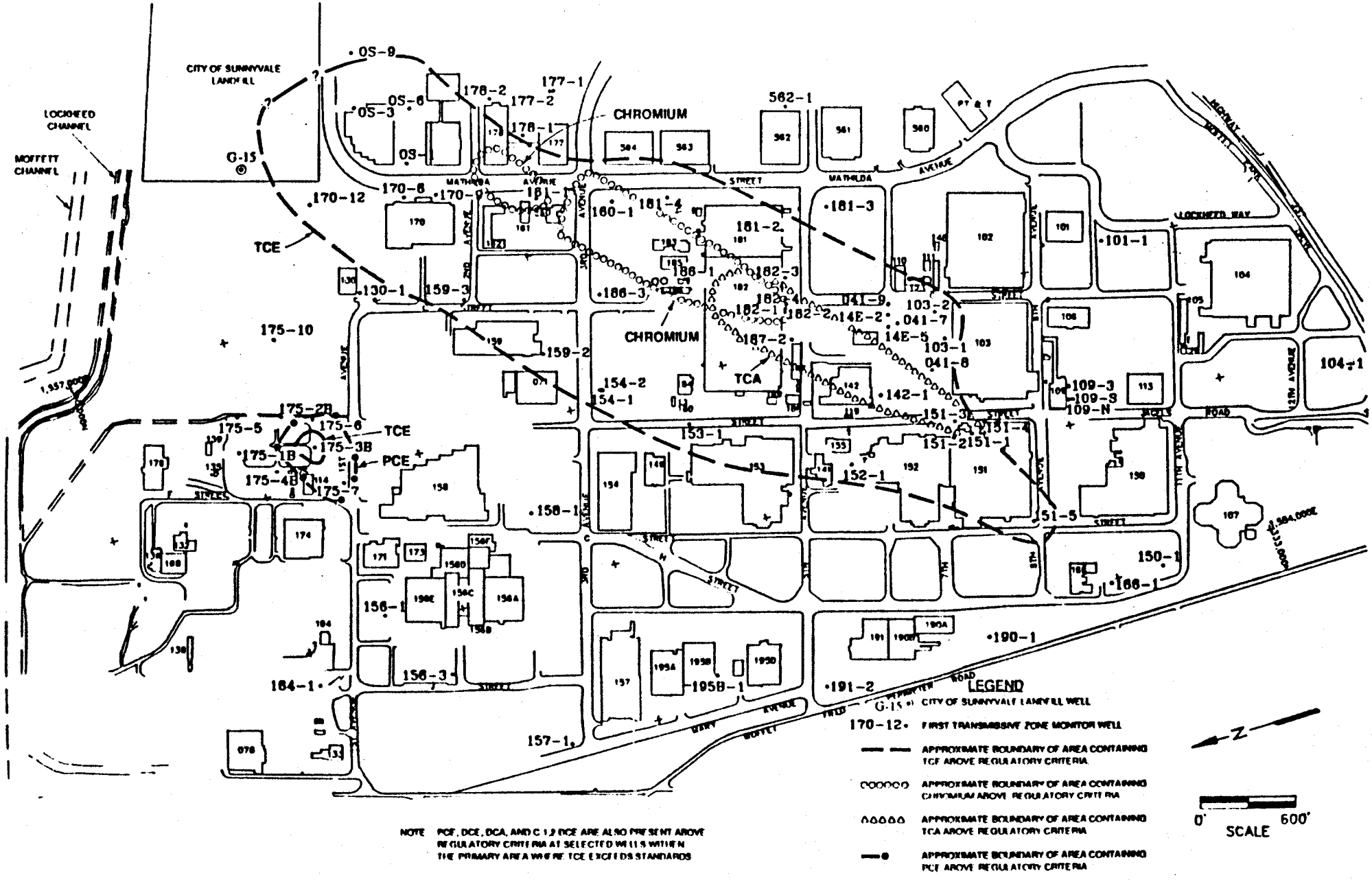
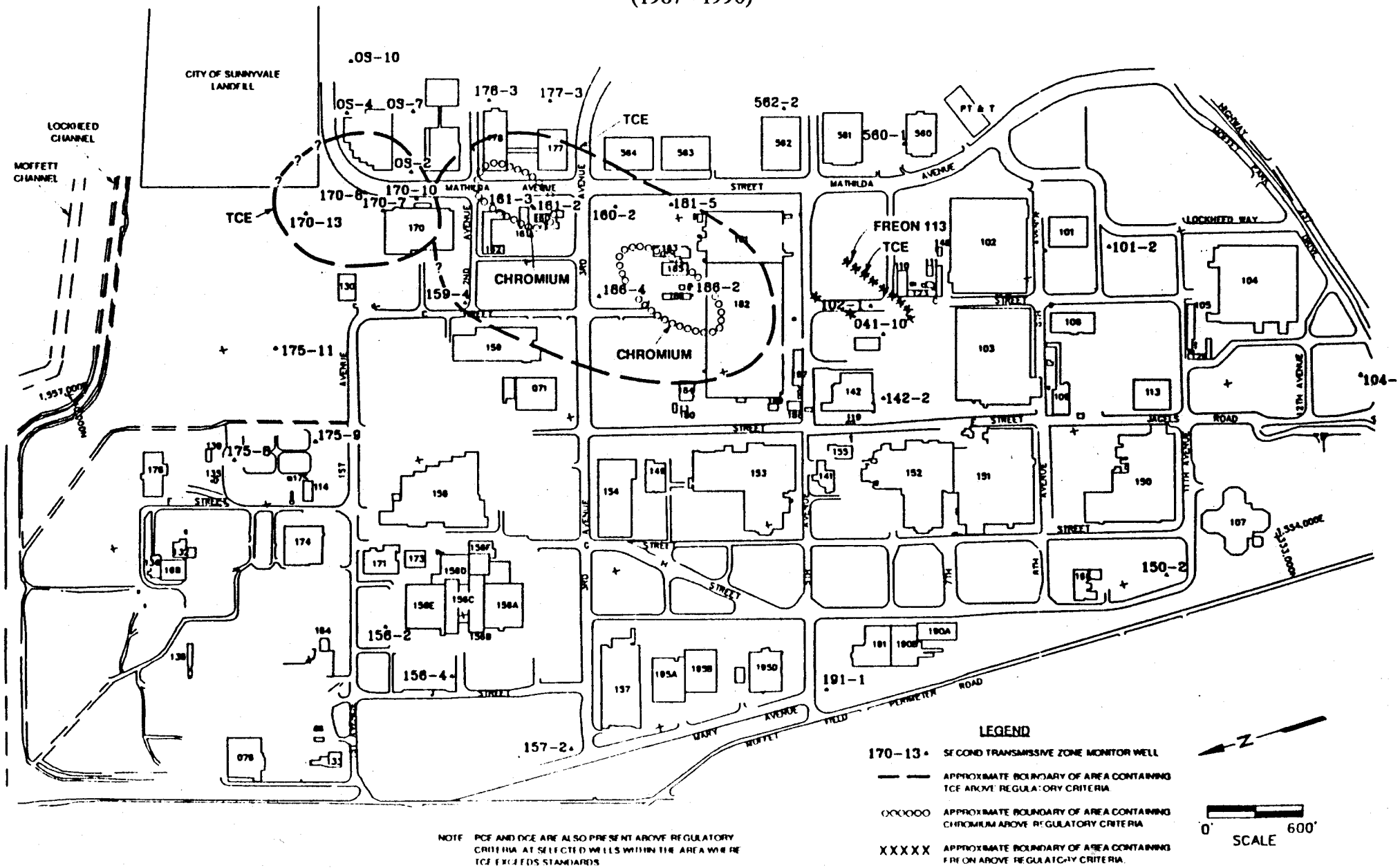


Figure 4
Initial Distribution of Contaminants
in the Second Transmissive Zone
Lockheed Plant One Facility
(1987 - 1990)



CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

SELF-MONITORING AND REPORTING PROGRAM

FOR

LOCKHEED MARTIN SPACE SYSTEMS COMPANY, MISSILES & SPACE OPERATIONS,
PLANT ONE FACILITY

1111 LOCKHEED MARTIN WAY,
SUNNYVALE, SANTA CLARA COUNTY

ORDER NO. 00-124

AUTHORITY AND PURPOSE

1. The Regional Board requests the technical reports required in this Self-Monitoring Program (SMP) pursuant to Water Code Sections 13267 and 13304. This SMP is intended to document compliance with Regional Board Order No. 00-124 (Site Cleanup Requirements).

GROUNDWATER MONITORING: WELLS, PARAMETERS, METHODS, & SCHEDULE

2. The discharger(s) shall measure groundwater elevations in monitoring wells and collect and analyze representative groundwater samples according to the updated Self-Monitoring Program specified in Table A-1. Table A-1 specifies monitoring frequency, monitoring period, and monitoring parameters for each well, and the analytical detection methods to be used. For reference purposes, Table A-1 also summarizes the historic SMP so that changes can easily be seen.

3. Changes to the SMP proposed by the discharger(s) must be approved by the Executive Officer prior to implementation.

REPORTING AND RECORD KEEPING

4. The Discharger(s) shall submit two monitoring reports per year. These monitoring reports shall be submitted on a semi-annual schedule as indicated in Table A-2. All monitoring activities that occur during each semi-annual period shall be included in the semi-annual report for that period. All monitoring reports shall be submitted to the Regional Board no more than 45 days after the end of the monitoring period as indicated in Table A-2.

Table A-2 Monitoring Periods and Reporting Due Dates

Monitoring Periods	Reporting Due Dates
First Semi-Annual (Feb - Jul)	Sep 15
Second Semi-Annual (Aug - Jan)	Mar 15

5. All monitoring reports shall include the following information:

   a. **Transmittal Letter**: A letter transmitting essential points shall be included in each monitoring report. The transmittal letter shall discuss any violations during the reporting period and actions taken or planned to correct the problem. The letter shall also certify the completion of all monitoring requirements. The letter shall be signed by the discharger's principal executive officer or his/her duly authorized representative, and shall include a statement by the official, under penalty of perjury, that the report is true and correct to the best of the official's knowledge.

   b. **Graphic Presentation**: Include site maps (plot plans) for each aquifer or water-bearing zone monitored that are drawn to a scale that remains constant from reporting period to reporting period. These maps shall include the following information:

(1) Known or probable contaminant sources
(2) Well locations
(3) Groundwater elevation contours
(4) Inferred groundwater flow direction(s)
(5) Extent of phase-separated product (NAPL)
(6) Extent of dissolved chemical constituents (isoconcentration maps)
(7) Selected analytical results

Line or bar graphs are helpful to illustrate variations in groundwater elevations, phase-separated product thickness, and dissolved chemical concentrations with time. Geologic cross sections are required if new data is available and/or the previous interpretation of subsurface conditions has changed. When required, geologic cross sections shall include the following:

(8) Vertical and lateral extent of contamination
(9) Contaminant sources
(10) Geologic structures
(11) Soil lithology
(12) Water table/piezometric surfaces
(13) Sample locations
(14) Sample analytical results
(15) Subsurface utilities and any other potential natural or manmade conduits for contaminant migration

c. **Tabular Presentation**: Present all of the following data in one or more tables to show a chronological history and allow quick and easy reference:

(1) Well designations
(2) Well construction (including top of well casing elevation, total well depth, screen interval depth below ground surface, and screen interval elevation)
(3) Groundwater depths
(4) Groundwater elevations
(5) Horizontal groundwater gradients
(6) Vertical groundwater gradients (including comparison wells from different zones)
(6) Phase-separated product elevations
(7) Phase-separated product thicknesses
(8) Analytical results (including analytical method and detection limits for each constituent)
(9) Measurement dates
(10) Groundwater extraction, including:
  (a) Average daily extraction rate
  (b) Total volume extracted for monitoring period
  (c) Cumulative total volume extracted since system inception
(11) Contaminant mass removal, including:
  (a) Average daily removal rate
  (b) Total mass removed for monitoring period

(c) Cumulative total mass removed since system inception

d. **Discussion**: Provide a discussion of the field and laboratory results that includes the following information:

(1) Data Interpretations
(2) Conclusions
(3) Recommendations
(4) Newly implemented or planned investigations & remedial measures
(5) Data anomalies
(6) Variations from protocols
(7) Conditions of wells

e. **Appendices:** Include the following information in appendices, unless the information is already contained in an approved Sampling and Analysis Plan:

(1) New boring and well logs
(2) The method and time of water level measurements
(3) Purging methods and results including the type of pump used, pump placement in the well, pumping rate, equipment and methods used to monitor field pH, temperature, and conductivity, calibration of the field equipment, pH, temperature, conductivity, and turbidity measurements, well recovery time, and method of disposing of the purge water
(4) Sampling procedures, field and travel blanks, number and description of duplicate samples, type of sample containers and preservatives used, the date and time of sampling, the name and qualifications of the person actually taking the samples, and any other relevant observations
(5) Laboratory statements of results of analyses
(6) Laboratory quality assurance/quality control (QA/QC) information and results including analytical methods, detection limits, recovery rates, explanations for low recovery rates (less than 80%), equipment and method blanks, spikes and surrogates, and QA/QC sample frequency
(7) Electronic files (ASCII or Excel® format) containing all analytical results and water level measurements

The appendices need not include the actual laboratory analytical data sheets and QA/QC report summary, however, this information shall be provided upon request.

6. **Violation Reports**: If requirements in this Order are violated, the Discharger shall notify the Regional Board by telephone as soon as practicable. Regional Board staff may, depending on violation severity, require the Discharger to submit a separate technical report on the violation within five working days of the telephone notification.

7. **Other Reports**: The Discharger shall notify the Regional Board in writing prior to any site activities, such as construction or removal work, that have the potential to cause further migration of contaminants or provide new opportunities for site investigation.

8. **Record Keeping**: The Discharger or their agent shall retain data generated for the above reports, including laboratory results and QA/QC data, for a minimum of six years after origination and shall make them available to the Regional Board upon request.

9. **SMP Revisions**: Revisions to the Self-Monitoring Program may be ordered by the Executive Officer, either on his/her own initiative or at the request of the Discharger. Prior to making SMP revisions, the Executive Officer will consider the burden, including costs, of associated self-monitoring reports relative to the benefits to be obtained from these reports.

I, Loretta K. Barsamian, Executive Officer, hereby certify that the foregoing Self-Monitoring and Reporting Program was adopted by the Regional Board on November 29, 2000.

for Loretta K. Barsamian
Executive Officer

Table A-1
Lockheed Martin Space Systems Company, Missles & Space Operations - Plant One Facility, Self Monitoring Program (SMP) for Order No. 00-124

Well ID	Well Construction Details			Historic Self Monitoring Program (for reference only)							Updated Self Monitoring Program									
	date installed	screen interval	zone screened[1]	Head	VOCs[2]	Freon-113[3]	TCFM[4]	Cr[5][6]	NO_3[6]	MtBE[7]	Head	TCA	DCA	VOCs PCE	TCE	DCE	Freons Freon-113[3]	TCFM[4]	Cr[5][6]	NO_3[6]	MtBE[7]
		fbgs																			
T1																					
041-8	May-87	5 - 15	T1								SA-1,3	SA-1,3		SA-1,3	SA-1,3						A-3
041-9	May-87	8 - 18	T1	A-1	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		
101-1	Sep-87	8 - 18	T1	A-1	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3			
104-1	1987	21 - 31	T1 (T1B?)	A-1	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3			
109-3	7/89	6 - 21	T1								A-3										A-3
130-01	Aug-88	17 - 22	T1	M							SA-1,3			SA-1,3	SA-1,3						
142-1	Aug-88	15 - 21	T1	A-1							SA-1,3	SA-1,3		SA-1,3	SA-1,3		SA-1,3	SA-1,3	SA-1,3		
150-1	Sep-87	11 - 21	T1	A-1	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3			
151-3	1985	10 - 15	T1	A-1	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3			
152-1	7/89	8 - 25	T1								SA-1,3	SA-1,3			SA-1,3						
156-1	Sep-87	9 - 19	T1	A-1							SA-1,3										
157-1	Jan-83	10 - 21	T1	A-1	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3			
159-02	Sep-87	18 - 28	T1	M							SA-1,3			SA-1,3	SA-1,3						
159-03	Aug-88	11 - 16	T1	M	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3			
160-01	Aug-88	13 - 18	T1	M							SA-1,3	SA-1,3			SA-1,3				SA-1,3		
161-01	Dec-88	7 - 17	T1	M				A-1			SA-1,3	SA-1,3		SA-1,3	SA-1,3				SA-1,3	SA-1,3	A-3
170-06	1985	5 - 12	T1	M							SA-1,3			SA-1,3							
170-09	Sep-88	12 - 18	T1	M							SA-1,3			SA-1,3	SA-1,3				SA-1,3	SA-1,3	
170-12	Sep-89	8 - 13	T1	M	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3			
170-15	Jul-91	9 - 19	T1	M							SA-1,3										
170-16	Jul-91	8 - 18	T1	M							SA-1,3										
170-19	Jul-91	11 - 16	T1	M							SA-1,3										
170-21	Jan-93	8 - 16	T1	M							SA-1,3										
170-22	Jan-93	9 - 19	T1	M							SA-1,3										
175-6*	Dec-85	5 - 9	T1		SA-1,3	SA-1,3		SA-1,3	SA-1,3		SA-1,3	SA-1,3		SA-1,3			SA-1,3				
175-7*	Dec-85	4 - 11	T1		SA-1,3	SA-1,3		SA-1,3	SA-1,3		SA-1,3	SA-1,3		SA-1,3			SA-1,3				
175-10	Sep-89	5 - 12	T1	M							SA-1,3			SA-1,3							
177-01	Oct-89	12 - 21	T1	M	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3			
178-01	Aug-88	5 - 10	T1	M							SA-1,3				SA-1,3				SA-1,3		
178-02	Sep-89	18 - 25	T1	M							SA-1,3										
178-09	Jul-91	9 - 22	T1	M							SA-1,3				SA-1,3						
178-13	Jan-93	15 - 25	T1	M							SA-1,3										
181-4 --> 181-6	Aug-97	9 - 16	T1	A-1	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		
186-03	Dec-88	14 - 19	T1	M							SA-1,3	SA-1,3		SA-1,3	SA-1,3				SA-1,3		
191-2	Aug-87	20 - 30	T1 (T1B?)	A-1	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3			
562-01	1985	7 - 17	T1	M	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3			
OS-01	Jan-89	7 - 17	T1	M					A-1		SA-1,3			SA-1,3	SA-1,3					SA-1,3	
OS-03	Jan-89	7 - 16	T1	M	A-1		A-1		A-1		SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3		SA-1,3	
OS-06	Jan-89	7 - 19	T1	M							SA-1,3				SA-1,3				SA-1,3		
OS-09	Jan-89	8 - 18	T1	M	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3			
WP-01	1988?	4 - 9	T1	M							SA-1,3										
WP-02	1988?	4 - 9	T1	M							SA-1,3										
WP-03	1988?	4 - 9	T1	M							SA-1,3										
WP-04	Nov-90	4 - 9	T1	M							SA-1,3										
G-15**			T1	M							SA-1,3	SA-1,3			SA-1,3				SA-1,3		
T1/T2																					
177-02	Sep-89	21.5 - 34.5	T1/2	M	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3			
178-05	Jul-91	18.5 - 33.5	T1/2	M							SA-1,3	SA-1,3			SA-1,3						
178-07	Jul-91	20 - 35	T1/2	M							SA-1,3								SA-1,3		
T2																					
101-2	Sep-87	40 - 45	T2	A-1	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3			

Table A-1
Lockheed Martin Space Systems Company, Missles & Space Operations - Plant One Facility, Self Monitoring Program (SMP) for Order No. 00-124

	Well Construction Details			Historic Self Monitoring Program (for reference only)							Updated Self Monitoring Program										
														VOCs			Freons				
Well ID	date installed	screen interval	zone screened[1]	Head	VOCs[2]	Freon-113[3]	TCFM[4]	Cr[4,5]	NO_3[6]	MtBE[7]	Head	TCA	DCA	PCE	TCE	DCE	Freon-113[3]	TCFM[4]	Cr[4,5]	NO_3[6]	MtBE[7]
		fbgs																			
102-1	Aug-88	39 - 45	T2	A-1		A-1					SA-1,3	SA-1,3		SA-1,3	SA-1,3		SA-1,3	SA-1,3			A-3
142-2	Aug-88	35 - 44	T2	A-1							SA-1,3	SA-1,3		SA-1,3	SA-1,3		SA-1,3	SA-1,3			
150-2	Sep-87	38 - 43	T2	A-1	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3			
157-2	Sep-87	30 - 40	T2	A-1	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3			
159-04	Aug-88	39 - 47	T2	M	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3			
160-02	Dec-88	31 - 36	T2	M							SA-1,3	SA-1,3			SA-1,3				SA-1,3		
161-02	Jan-89	27 - 32	T2	M				A-1			SA-1,3	SA-1,3		SA-1,3	SA-1,3				SA-1,3	SA-1,3	A-3
170-07	Sep-87	30 - 35	T2	M							SA-1,3			SA-1,3							
170-08	Aug-88	29 - 39	T2	M							SA-1,3				SA-1,3						
170-10	Sep-88	28 - 38	T2	M							SA-1,3			SA-1,3	SA-1,3				SA-1,3	SA-1,3	
170-13	Sep-89	31 - 43	T2	M	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3			
170-17	Jul-91	34 - 39	T2	M							SA-1,3										
170-18	Jul-91	27 - 36	T2	M							SA-1,3										
170-20	Jul-91	21 - 31	T2 (T1B?)	M							SA-1,3										
170-23	Jan-93	37 - 48	T2	M							SA-1,3										
175-9	Sep-89	32 - 37	T2								SA-1,3	SA-1,3		SA-1,3			SA-1,3	SA-1,3			
178-03	Oct-89	35 - 45	T2	M							SA-1,3								SA-1,3		
178-10 (DW-2)	Jul-91	32 - 40	T2	M							SA-1,3				SA-1,3						
178-11	Jan-93	34 - 39	T2	M							SA-1,3										
178-12 (JP-2)	Jan-93	35 - 41	T2	M							SA-1,3										
178-14 (HW-2)	Jan-93	27 - 42	T2	M							SA-1,3										
181-5 --> 181-7	Aug-97	27 - 33	T2	A-1	A-1	A-1	A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		
186-2	Jan-89	29 - 34	T2	A-1				A-1			SA-1,3	SA-1,3		SA-1,3	SA-1,3		SA-1,3	SA-1,3	SA-1,3		A-3
186-04	Jan-89	28 - 38	T2	M	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3	SA-1,3		
191-1	Aug-87	39 - 49	T2	A-1	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3			
562-02	1985	38 - 48	T2	M	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3			
OS-02	Dec-88	33 - 38	T2	M					A-1		SA-1,3				SA-1,3				SA-1,3	SA-1,3	
OS-04	Jan-89	30 - 45	T2	M	A-1		A-1		A-1		SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3		SA-1,3	
OS-07	Oct-89	34 - 39	T2	M							SA-1,3				SA-1,3				SA-1,3		
OS-10	Sep-89	35 - 40	T2	M	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3			
T2B																					
104-2	Sep-87	53 - 63	~~T2~~-T2B	A-1	A-1		A-1				SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3	SA-1,3		SA-1,3			
156-2	Sep-87	45 - 55	T2B	A-1							SA-1,3										
161-3	Sep-89	42-47	T2B	M							SA-1,3	SA-1,3		SA-1,3	SA-1,3				SA-1,3		
170-24	Jan-93	39 - 44	T2B	M							SA-1,3										
175-11	Sep-89	49 - 54	T2B	M							SA-1,3			SA-1,3							
177-3	Sep-89	50 - 56	T2B	M							SA-1,3										
178-6	Jul-91	41-46	T2B	M							SA-1,3				SA-1,3						
178-8	Jul-91	49 - 54	T2B	M							SA-1,3										
T3																					
141-1	Aug-87	130 - 140	T3	A-1							SA-1,3	SA-1,3									
Extraction Wells																					
EW-01	Jan-92	10 - 40	T1 & T2	M	Q	Q	Q	Q			Q	Q	Q	Q	Q	Q	Q	Q	Q		
EW-02	Jan-92	10 - 40	T1 & T2	M	Q	Q	Q	Q			Q	Q	Q	Q	Q	Q	Q	Q	Q		
EW-03	Jan-92	10 - 40	T1 & T2	M	Q	Q	Q	Q			Q	Q	Q	Q	Q	Q	Q	Q	Q		
EW-04	Jan-92	10 - 40	T1 & T2	M	Q	Q	Q	Q			Q	Q	Q	Q	Q	Q	Q	Q	Q		
EW-05	Jan-92	10 - 40	T1 & T2	M	Q	Q	Q	Q			Q	Q	Q	Q	Q	Q	Q	Q	Q		
EW-06	Jan-92	10 - 40	T1 & T2	M	Q	Q	Q	Q			Q	Q	Q	Q	Q	Q	Q	Q	Q		
EW-07	Jan-92	10 - 40	T1 & T2	M	Q	Q	Q	Q			Q	Q	Q	Q	Q	Q	Q	Q	Q		
EW-08	Jan-93	10 - 40	T1 & T2	M	Q	Q	Q	Q			Q	Q	Q	Q	Q	Q	Q	Q	Q		
EW-09	Jan-93	10 - 40	T1 & T2	M	Q	Q	Q	Q			Q	Q	Q	Q	Q	Q	Q	Q	Q		

Table A-1
Lockheed Martin Space Systems Company, Missles & Space Operations - Plant One Facility, Self Monitoring Program (SMP) for Order No. 00-124

	Well Construction Details			Historic Self Monitoring Program (for reference only)							Updated Self Monitoring Program									
														VOCs			Freons			
Well ID	date installed	screen interval	zone screened[1]	Head	VOCs[2]	Freon-113[3]	TCFM[4]	Cr^{6+}[5]	NO_3[6]	MtBE[7]	Head	TCA	DCA	PCE	TCE	DCE	Freon-113[3]	TCFM[4]	Cr^{6+}[5]	NO_3[6]	MtBE[7]
		fbgs																		
EW-10	Jan-93	10 - 40	T1 & T2	M	Q	Q	Q	Q			Q	Q	Q	Q	Q	Q	Q	Q	Q		
EW-11	Jan-93	10 - 40	T1 & T2	M	Q	Q	Q	Q			Q	Q	Q	Q	Q	Q	Q	Q	Q		

Bolded monitoring frequency indicates that the parameter is new for that well

* These wells are monitored for VOCs, Freons, Total Chromium, & Nitrate as part of the Detection Monitoring Program (DMP) for the Process Wastewater Treatment & Reclamation Facility.

** Well G-15 is part of the City of Sunnyvale's Landfill monitoring network.

[1] Transmissive Zones Beneath the Site:

T1 = 5 to 25 fbgs

T2 = 30 to 55 fbgs

T1/T2 = well is screeend across the portions of T1 and T2

T1 & T2 = well screened completely across T1 and T2

T2B = well mainly screened across lower portion of T2

T3 = 130 to 160 fbgs

[2] VOCs by EPA Method 8021B or 8260B; reporting should include: 1,1,1-TCA, 1,1-DCA, PCE, TCE, 1,1-DCE, & 1,2-DCE.

[3] Freon-113 by EPA Method 8021B or 8260B.

[4] TCFM by EPA Method 8021B or 8260B.

[5] Cr^{6+} by EPA Method 7190, 7191, or equivalent based on appropriate detection limits.

[6] NO_3 by EPA Method 300 or equivalent.

[7] MtBE by EPA Method 8260B.

KEY

M = monthly monitoring

Q = quarterly monitoring according to the following schedule:

1st quarter = Feb thru Apr

2nd quarter = May thru Jul

3rd quarter = Aug thru Oct

4th quarter = Nov thru Jan

SA-1,3 = semi-annual monitoring during first and third quarters

A-1 = annual monitoring during first quarter